Sessional Paper 1011/92
4 Session, 22 Legislature

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THE IMPACT OF NOVATEL ON THE ALBERTA ECONOMY

PREPARED FOR

Technology, Research and Telecommunications
Government of Alberta

BY

Wright Mansell Research Ltd.

September, 1992

EXECUTIVE SUMMARY

The objective in this study is to evaluate the impacts of NovAtel on the Alberta economy. The prudence of decisions relating to the management and operations of NovAtel while owned by the government or the impacts on provincial government finances are the subject of other assessments and are not evaluated here.

1. The impacts of NovAtel in terms of key macroeconomic variables are summarized below. These impacts include the direct and indirect (or multiplier) effects associated with both investment and operating expenditures.

CUMULATIVE IMPACTS OF NOVATEL ON SELECTED ALBERTA ECONOMIC INDICATORS, 1983 - 2002

	1983-1991	1983-2002	
		Low Case	High Case
Increase in Employment in person years	19,045	78,214	100,983
Increase in Gross Domestic Product in millions of 1992$	1,720	7,429	9,762
Increase in Personal Income in millions of 1992$	1,491	6,440	8,462
Increase in Gov't of Alberta Revenues in millions of 1992$	184	798	1,043

Source: MAE simulations

2. It is estimated that, over the historical period, NovAtel resulted in an increase of about 19 thousand person years of employment for Albertans. The cumulative impacts on real Alberta Gross Domestic Product and Personal Income were approximately $1.7 billion (1992$) and $1.5 billion respectively. The increase in gross revenue of the provincial government was about $180 million.

3. The largest impacts are expected to be in the future. It is anticipated that the management and international marketing expertise provided by Northern Telecom and Telexel / Digicom will lead to expanded production and sales of the product lines acquired from the 'old' NovAtel and of new variants of these product lines. Under a pessimistic scenario (the Low Case), the cumulative increase in Alberta employment for the period 1983 to 2002 is over 78 thousand person years. In the case where there is significant future growth in the sales of the product lines and derivatives acquired from the 'old' NovAtel, the cumulative increase over the same period is more than 100 thousand person years. The total impacts on real Alberta GDP for 1983 to 2002 range from $7.4 billion (1992$) to $9.8 billion. The comparable increase in Personal Income received by Alberta residents is between $6.4 and $8.5 billion. The cumulative impact on tax revenues of the provincial government is an increase of between $800 million and $1 billion. This is the impact on gross revenues and does not include adjustments to reflect additional provincial government expenditures that are directly or indirectly attributable to NovAtel. Further, it should be noted that the expected or most probable impacts on employment, output, income and revenues are closer to those shown under the High Case than to those under the Low Case.

4. There are a number of other effects which, although not quantified, are very important. For example, NovAtel has been instrumental in the establishment of the infrastructure and resources (production and research facilities, specialized training and cooperative research programs, local suppliers of inputs, a critical mass of specialized labour and scientists etc.) necessary for the growth and development of a microelectronics / wireless communications industrial complex in Alberta. The benefits of this include: an important degree of economic diversification and added stability; many new employment and income opportunities for a highly skilled and educated labour force; the distribution of these opportunites across the province; the potential for technological synergies and spillovers which assist other Alberta sectors; and the growth of an environmentally clean industry.

5. In summary, these macroeconomic and other benefits of NovAtel are very important and, under the management of Telexel / Digicom and Northern Telecom, they can be expected to continue well beyond the period used for the analysis presented here.

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1. INTRODUCTION

1.1 Objectives

NovAtel Communications Ltd. (NovAtel) was formed in 1983 as a joint venture of Alberta Government Telephones (AGT) and NOVA Corporation of Alberta (NOVA). By the late 1980s, NovAtel had become a major manufacturer and supplier of Cellular Systems (the telecommunications equipment involved in providing cellular phone service) and of Subscriber Equipment (eg., cellular handsets) in both domestic and international markets.

In 1989, AGT purchased NOVA's shares in NovAtel and, at the end of 1990, the Government of Alberta acquired NovAtel from AGT. In May of 1992, one of the product lines (the 800 MHz System) was sold to Northern Telecom Canada Ltd. (Northern Telecom). The remaining product lines and facilities were sold to Telexel Holding Ltd. and Digicom Cellular International Co. Ltd. and will continue under the name NovAtel Communications Ltd. Expansions in operations are anticipated under the new management by Northern Telecom and Telexel / Digicom.

Various assessments of past investments in NovAtel are currently being undertaken. One important element of any such evaluation must be the impacts of these investments on the Alberta economy. The objective in this study is to estimate and evaluate these impacts. Attention is focussed on the effects in terms of measures such as total employment, output, incomes and revenues generated in Alberta, and on the extent to which it has contributed to development and diversification of the province's economic base.

It should be emphasized that this study deals only with economic impacts and does not examine the efficacy or prudence of decisions relating to the management and operation of NovAtel or the impacts on provincial government finances. Such matters are the subject of other reviews currently underway.

1.2 Background

Certain basic information about NovAtel's operations is necessary to provide perspective and to understand the evaluation presented in subsequent sections. This information is

summarized below. It was obtained from annual reports and other documentation provided by NovAtel and from discussions with officials in NovAtel, Northern Telecom and in various supplier companies. Because of confidentiality for commercial / competitive reasons, certain details concerning products and markets are not disclosed in this report.

NovAtel Development and Growth, 1983 to 1991

During the 1970s AGT had one of the busiest mobile radio telephone networks, largely as a result of the rapid growth of the oil and gas sector. NOVA was one of AGT's largest customers and was interested in diversifying into areas complementary to its pipeline business.

In January 1983, AGT and NOVA formed a joint partnership to design and manufacture cellular mobile phones. NovAtel was created by combining the assets of AGT-owned Westech Systems Ltd. of Edmonton and the assets of International Systcoms Ltd. of Montreal. A corporate head office and the research and development (R&D) department was established in Calgary in 1983 and, in the same year, a plant was acquired in Lethbridge. Production in this plant began in 1984 and it was in full operation by 1985. The Lethbridge plant was expanded in 1990 and, in the same year, production began at the Calgary Computer Integrated Manufacturing facility (CIMPLEX). In March 1991, just under 80% of NovAtel's 1600 employees were located in Alberta. The remainder were in other parts of Canada (Toronto and Montreal), the U.S.(Atlanta and Fort Worth), the U.K. and Norway.

The company concentrated on R&D in the initial years and this eventually resulted in numerous patents and many new products. The first products included the 400 MHz Cellular System (the first units were sold to AGT Mobile Communication) and a series of cellular telephone sets. By 1985, NovAtel was the fourth largest supplier of cellular phones in North America. Between 1986 and 1990 about 60% of NovAtel's sales were in the U.S.

Products introduced since 1985 include: the 800 MHz Cellular System (which is widely used in the U.S.); specialized 400, 450, 800 and 900 MHz Cellular Systems for various markets around the world; transportable, handheld and handsfree transceivers; and, a

Supplementary Cellular System (to provide an instant, localized communications network).

Changes Under New Ownership and Management

As noted at the outset, AGT purchased NOVA's shares in NovAtel in 1989 and then, on December 31, 1990, the Government of Alberta acquired the company from AGT. On May 21, 1992, the business, except for the 800 MHz Cellular Systems division and Systems Financing, was sold to Telexel / Digicom and continues to use the NovAtel name. The 800 MHz Systems division was sold to Northern Telecom while the Systems Financing division remains with the provincial government.

The 'new' Novatel is nearing the completion of the restructuring that began with the take over by Telexel / Digicom and a long run business strategy is now in place. Initially, this will involve a focus on three main product lines: premium digital and analogue cellular phones; the Global Positioning System (a satellite-based tracking system); and, the Supplementary Communications System (a portable cellular system). Agreements have recently been signed with a number of companies (including IBM and Motorola) and other new venture and marketing agreements are expected in the near future. These, in combination with the international connections and marketing expertise provided by the new management, are anticipated to result in significant growth for NovAtel. Much of the additional manufacturing is planned for the plants in Lethbridge and Calgary.

With the acquisition of the 800 MHz system, Northern Telecom is in the process of consolidating its cellular systems development and manufacturing for national and international markets at its Alberta facility. In addition, it is establishing in Calgary a Centre of Excellence for wireless research and development. Given the expected growth in demand for Cellular Systems and Northern Telecom's excellent record in product research, development and marketing, it is anticipated that this restructuring will lead to many new employment opportunities in Alberta.

1.3 Outline

The impacts of NovAtel over the period 1983 to 1991 are examined in Secton 2. It

provides a discussion of the direct and indirect impacts on aggregates such as employment, income, exports and government revenues, as well as the implications for economic development and diversification in Alberta.

An important issue is the extent to which the economic effects of NovAtel are long term and will result in new opportunities and growth into the future. This issue is taken up in Section 3. Estimates of the macroeconomic impacts over the next decade are presented using a range of projections.

The impacts of NovAtel over the historical and future periods are summarized in Section 4.

2. HISTORICAL IMPACTS

2.1 Methodology

The basic tool used to evaluate the impacts of NovAtel on the provincial economy is an updated and compressed version of MAE 2.0. This is a large, highly disaggregated, econometric model of the Alberta economy designed to measure the effects of a variety of projects and policies and to prepare economic projections.[1] The linkages and parameters in this model have been estimated using data covering the period 1961 to 1991.

The first step in this exercise involves running a *control case*. This provides the benchmark values for endogenous variables (such as employment, income, revenues etc.) against which the effects of NovAtel are measured. These values are generated by running the model over the period 1983 to 2002. The values for the period 1992 to 2002 are required for estimating the future impacts of NovAtel (as discussed in Section 3) and involve the use of projections for exogenous variables such as interest rates and growth rates in Canada and the United States.

The generation of a *shock case* is the second step. This is accomplished by subtracting certain direct inputs (for example, annual NovAtel investment expenditures, sales and purchases) from the appropriate blocks in MAE 2.0 and then re-running the model over the period 1983 to 2002. This gives values for variables such as total Alberta employment, income, output and revenues for a counterfactual / hypothetical case where NovAtel never existed.

The impacts of NovAtel are then computed as the output values for the control case, minus the corresponding values for the shock case. These differences are broken down into two periods. The differences for the period 1983 to 1991 measure historical impacts and those for the period 1992 to 2002 indicate the prospective impacts. It should be emphasized that the cutoff year (2002) is based on factors such as the unavailability and / or unreliability of longer term projections and is not based on any prediction or assumption that operations involving the assets purchased from the 'original' NovAtel will end in that year.

2.2 Economic Summary of NovAtel Operations, 1983 to 1991

The approach described above for the measurement of the macroeconomic impacts requires data on certain key dimensions of NovAtel's operations. This includes annual values for such things as capital expenditures in Alberta, employment (by type) in the province, sales and the source of inputs. Cumulative (1983 - 1991) totals for selected dimensions are provided in Table 1.

TABLE 1
CUMULATIVE VALUES FOR SELECTED DIMENSIONS OF NOVATEL'S OPERATIONS, 1983 - 1991

Employment in Alberta, in person years	6,235
Wages and Salaries paid to Albertans, in millions of 1992$	260
Investment Expenditures in Alberta, in millions of 1992 $	155
Total Sales, in millions of 1992 $	1,472
Exports from Alberta, in millions of 1992$	1,322

Source: Computed using annual data from various reports, statements and records obtained from NovAtel.

As shown, over the period 1983 - 1991, NovAtel employment in Alberta amounted to over 6000 person years. Approximately 55% of these jobs were classified as management, professional / technical, technical or professional / administration. The remainder were categorized as clerical, production or sales / marketing.

During this same period, NovAtel purchased about $415 million (1992 Canadian dollars)

worth of Alberta-sourced inputs (that is, about $260 million for Alberta labour plus $155 million for other locally-sourced inputs), and generated over $1.3 billion of exports from the province. In recent years, NovAtel's annual sales have represented about 1.5% of total manufacturing shipments from Alberta.[2]

2.3 Macroeconomic Impacts of NovAtel, 1983 - 1991

The dimensions summarized above represent the direct or immediate impacts of NovAtel over the historical period. However, they do not reflect the full extent of the impacts on the overall provincial economy. For example, many additional jobs were created in Alberta when NovAtel workers spent their paychecks or when NovAtel purchased inputs such as components, packaging, accounting or transportation from suppliers in the province. These types of indirect or 'multiplier' effects are usually very significant and they must be taken into account in any proper assessment of the total impacts of a new activity or industry.

The model and methodology outlined previously in Section 2.1 captures these effects. Specifically, it incorporates the linkages which give rise to three main multiplier impacts. These are referred to as Leontief or interindustry, Keynesian and population multiplier effects.[3] The interindustry impacts arise from the purchase of inputs by, in this case, NovAtel. For example, the purchase of phone cases from Amptech Corporation (an Alberta manufacturer of plastic products) means larger sales for Amptech and larger purchases of inputs by Amptech. Some of these inputs will be provided by other companies (for example, those supplying, say, transportation services or electricity) that, in turn, will expand. This process continues and can result in the wide distribution of stimulative effects across industries.

The Keynesian multiplier impacts primarily occur through the linkages between income and aggregate demand. For example, some of wages and salaries paid by NovAtel to its employees will be spent on a variety of consumer goods and services and some will accrue to governments in the form of income taxes. The increase in aggregate demand arising from these consumption expenditures and from the government expenditures of tax revenues results in larger incomes for those providing the goods and services (construction workers, retailers, professionals etc.) and they, in turn, increase their expenditures. This

process continues and under most circumstances leads to significant expansion in the level of economic activity.

The population multiplier impacts primarily occur via migration. The level of migration to / from Alberta is directly and strongly related to relative regional income and employment opportunities.[4] For instance, an improvement in employment and / or income opportunities in Alberta relative to these opportunities in other provinces (especially those in the other western provinces and in Ontario) typically causes an increase in net migration to the province. Consequently, to the extent that a venture such as NovAtel causes an improvement in Alberta's economy, it results in a larger population than would otherwise exist. This larger population, in turn, translates into greater demand for infrastructure (such as housing) and various consumer goods and services. Supplying these demands leads to further growth of economic activity in the province.

The total (direct plus indirect) impacts of NovAtel over the historical period 1983 - 1991 on selected Alberta economic indicators are summarized in Table 2. The annual impacts are provided in the Appendix.

TABLE 2
CUMULATIVE IMPACTS OF NOVATEL ON SELECTED ALBERTA ECONOMIC INDICATORS, 1983 - 1991

Increase in Employment in Alberta, in person years	19,045
Increase in Alberta Gross Domestic Product, in millions of 1992$	1,720
Increase in Alberta Personal Income, in millions of 1992$	1,491
Increase in Government of Alberta Revenues, in millions of 1992$	184

Source: MAE simulations

The total employment in Alberta over the nine year period as a result of capital and operating expenditures by NovAtel amounts to over 19,000 person years. To put this into perspective it might be noted that the average annual increase in total Alberta employment from 1987 to 1991 (a period of significant growth) was about 25,000.[5] In other words, the total employment impact of NovAtel from 1983 to 1991 is almost equivalent to total employment growth in the province in an average year.

Gross Domestic Product (GDP) is a common measure of economic activity. Alberta GDP is defined as the sum of the value of all final goods and services produced within the province's geographical boundaries. The impact of NovAtel on Alberta GDP has been approximately $1.7 billion (1992$) for the period 1983-1991 or about $191 million on an average annual basis.

Provincial Personal Income measures total income received by residents of the province. As shown in Table 2, the cumulative impact on Alberta Personal Income has been about $1.5 billion (1992$) or roughly $166 million on an average annual basis. The cumulative impact on total revenues of the Alberta government has been $184 million (1992$). This is the additional gross revenue accruing to the government (in the form of personal income taxes, corporate income taxes and indirect taxes) as a result of economic activity directly and indirectly attributable to NovAtel over the period 1983 to 1991.

2.4 Other Impacts

The high degree of variability of the Alberta economy has been and continues to be a major concern.[6] This has been highlighted in recent years with the significant loss of jobs in the province's key agriculture and energy sectors. An important element of the policy response to this variability and the need for new jobs to replace those being lost in these sectors involves initiatives aimed at encouraging diversification and general economic development.

There are many challenges that must be faced in attracting and developing new and diversifying industries in Alberta. In order to be viable in the province over the long term there must be a natural comparative advantage for the particular industry or there must be a reasonable prospect that a comparative advantage can be developed (for example, through

investment in research, infrastructure and specialized skills). Other important requirements are: that it provides high-quality and high-skill employment opportunities for Albertans; that it is fairly stable or its activity cycles tend to be opposite those of existing industries in the province[7]; that it is consistent with or builds upon Alberta's strengths; and, that it is environmentally clean.

In the case of Alberta there are relatively few new activities or industries that, taken individually, can meet these requirements, especially the economic viability criterion. However, the prospects are brighter if the focus is shifted from specific activities to *industrial complexes.* Simply stated, an industrial complex is a combination of activities which are viable because of economies or synergies arising from the linkages among them. That is, the particular activities may not be economically viable in a region on an individual or stand alone basis but are economic as an integrated combination.[8]

It is in this context that the economic impacts of NovAtel are especially important. It has played a very significant role in the development in Alberta of a sizable and growing microelectronics and communications industrial complex. Although at the outset it exploited linkages and synergies with certain existing firms (such as AGT and NOVA), there were few linkages with other parts of the economy. For example, virtually all research, development, training and manufacturing had to be done 'in-house' because there did not exist other firms or institutions in the province with the capabilities to supply the highly specialized and advanced inputs.

However, over time this situation has changed, to a significant extent because of NovAtel. For example: NovAtel provided opportunities for firms such as Amptech (a manufacturer of specialized plastic products) to learn and implement new methods and processes that subsequently helped Amptech obtain supply contracts with other companies; NovAtel was important in the establishment and growth of training programs by the Southern Alberta Institute of Technology and TR Labs (associated with the University of Calgary) that have become a significant factor in the decisions by other firms (like Hughes) to locate or expand in Alberta; and, through cooperative research and development programs with organizations like TR Labs and the Alberta Microelectronic Centre, NovAtel has played an important role in fostering research, research capability and product development that will provide the basis for ongoing diversification and economic development in Alberta.

In summary, NovAtel has been instrumental in the development of the infrastructure and linkages necessary to have a viable and significant microelectronics / communications industrial complex in Alberta. As discussed in a later section, this complex is expected to continue to expand in the future and, in the process, to provide an important element of diversification, economic development and stability for the Alberta economy.

3. FUTURE IMPACTS

3.1 General Approach

It is likely that the largest impacts of NovAtel on the Alberta economy have yet to be felt. As noted in Section 1.2, under the management of Northern Telecom and Telexel / Digicom it is probable that the patents and product lines purchased from the 'old' NovAtel will serve as the base for the development of many new markets and products in the future. This growth, combined with the synergies and 'spin-offs' as Alberta's microelectronics / communications complex develops further, can be expected to result in substantial additions to income and employment opportunities in the province.

There are, however, considerable complexities in quantifying these future economic impacts. Some of the main reasons include: the fact that many of the gains in the area of microelectronics and wireless communication arise from basic research, 'learning by doing' and 'serendipity' and, as such, future developments are to a large degree unpredictable; the rapid and often unanticipated changes in advanced technology products and markets; and, uncertainty concerning the likelihood that activities comparable to those associated with the 'new' NovAtel or the Research and Development segment of the Cellular Systems division of Northern Telecom would be located in Alberta in the absence of the 'old' NovAtel.

A number of assumptions, judgements and cases are employed in the analysis in order to deal with these uncertainties. First, the terminal point of the analysis is limited to the year 2002. It is reasonable to expect that the basic product lines acquired from the 'old' NovAtel, the new products derived from these lines or the new products associated with the acquired infrastructure will be produced by NovAtel and Northern Telecom in Alberta well beyond 2002. However, this terminal date is employed to reflect uncertainty and ensure that the analysis errs on the side of underestimation rather than overestimation of the economic impacts.

Second, two cases are employed to capture a range of outcomes, with the 'expected' or most likely outcomes being somewhere between the results for these two cases. The **Low Case** essentially assumes no real growth from near term levels in the manufacture and sales of the product lines, or derivatives of these lines, acquired from the 'old' NovAtel.

For example, it is assumed that the anticipated 1992 /93 sales by NovAtel and the 800 MHz Systems sales by Northern Telecom remain constant in real terms (or in inflation-adjusted dollars) over the period to the year 2002. This represents a very pessimistic scenario. The **High Case** assumes that these sales grow in real terms at an average annual rate of 10%. This case is not unrealistic given the rapid growth that is expected over the next decade in markets for wireless communications equipment.

Third, it is WMR's judgement that the infrastructure and talent established in the province as a result of NovAtel was a major factor in the decisions that have allowed Alberta to continue to be an important source of wireless communications equipment and products. This assessment is based on discussions with many individuals knowledgeable about the factors affecting the location of research, development and manufacturing facilities for microelectronics. As noted earlier, this infrastructure / talent includes: the NovAtel facilities; highly specialized training programs; a 'critical mass' of scientists with appropriate specializations; a motivated labour force with the requisite skills for product manufacture; key research and development facilities; and, the establishment of certain local suppliers of inputs and complementary products. In the absence of these factors it seems likely that many or most of the activities spawned by NovAtel would have been located in the U.S. to take advantage of the much lower labour costs, the availability of generous location grants, lower tax levels, reduced transportation costs and the existence of a larger pool of scientific talent.

Using these assumptions, the method employed to estimate the economic impacts in the future is as described in Section 2.1. That is, the sales, investment expenditures, employment etc. consistent with the two cases outlined above are subtracted from the inputs used to generate the Control Case. The model is then run over the period to 2002 to generate the Shock Case. Finally, the future impacts of NovAtel are computed by subtracting the annual output values (for Alberta employment, GDP etc.) for the Shock Case from the corresponding values for the Control Case.

3.2 Macroeconomic Impacts of NovAtel, 1992 - 2002

The results for selected variables are shown in Table 3 (see the Appendix for annual values) The total impact on Alberta employment over the period 1992-2002 ranges from almost

TABLE 3
CUMULATIVE IMPACTS OF NOVATEL ON SELECTED ALBERTA ECONOMIC INDICATORS, 1992 - 2002

	Low Case	High Case
Increase in Employment in Alberta, in person years	59,169	81,938
Increase in Alberta Gross Domestic Product, in millions of 1992$	5,709	8,042
Increase in Alberta Personal Income, in millions of 1992$	4,949	6,971
Increase in Government of Alberta Revenues, in millions of 1992$	613	859

Source: MAE simulations

60,000 person years in the Low Case to just under 82,000 person years in the High Case. A reasonable expectation would be that the impact will turn out to be somewhere between these two cases and will more likely be closer to the High Case.

The cumulative impact on real Alberta GDP over this same period is between $5.7 billion (1992$) and $8 billion, again with the most probable outcome being closer to the result for the High Case. The increase in Personal Income ranges from almost $5 billion to just under $7 billion.

Finally, cumulative revenue of the Alberta Government is likely to be between $613 million and $859 million as a result of NovAtel. It should be noted that this is the impact on gross revenue and, as such, does not include any adjustment to reflect additional provincial government expenditures directly or indirectly attributable to NovAtel.

3.3 Other Impacts

As outlined in Section 2.4, over the relatively short period of 1983 to 1991, NovAtel has

played an important role in the development of the infrastructure, human resources and linkages required for a viable microelectronics / wireless communications manufacturing industry in Alberta. The prospects are bright for even more rapid growth and development under the new management and marketing expertise provided by Northern Telecom and Telexel / Digicom. Some of the factors in this regard include: the greater ability of the new organizations to develop international markets for the product lines acquired from the 'old' NovAtel and for derivative product lines; the substantial potential for new products and new variations on existing product lines arising from the numerous patents and intellectual properties acquired, the established research and development programs and the new research and development initiatives such as the Centre Of Excellence for wireless communications research and development; the prospects for significant technology transfers to other microelectronics products manufactured in Alberta and / or specialized products used by key Alberta industries (such as those in the oil and gas sector); and, the prospects for new Alberta firms to supply inputs for the design, manufacture or operation of wireless communications products (for example, inputs such software, system frames and cases and subscriber equipment accessories) and for existing Alberta suppliers to increase local sourcing in the purchase of their inputs.

This translates into excellent prospects for significant economic development and diversification based on the strengthening and growth of a microelectronics / communications industrial complex. The attendant benefits include greater economic stability and growth for the province, more opportunities for a highly educated and skilled labour force and the establishment of comparative advantages based on research and development, infrastructure and a rapid rate of implementation of new technology.

4. SUMMARY AND CONCLUSIONS

4.1 Macroeconomic Impacts

The objective in this study has been to assess the impacts of NovAtel on the Alberta economy. These impacts have been evaluated for two separate periods, the historical 1983-1991 period and the period 1992-2002. The macroeconomic implications have been determined using MAE 2.0, a disaggregated, econometric model of the Alberta economy, and the results for selected indicators are summarized in Table 4.

TABLE 4
CUMULATIVE IMPACTS OF NOVATEL ON SELECTED ALBERTA ECONOMIC INDICATORS, 1983 - 2002

	1983-1991	1983-2002	
		Low Case	High Case
Increase in Employment in person years	19,045	78,214	100,983
Increase in Gross Domestic Product in millions of 1992$	1,720	7,429	9,762
Increase in Personal Income in millions of 1992$	1,491	6,440	8,462
Increase in Gov't of Alberta Revenues in millions of 1992$	184	798	1,043

Source: MAE simulations

The increase in Alberta employment over the period 1983-1991 directly and indirectly as a result of NovAtel amounts to about 19,000 person years or an average annual increase of approximately 2100 person years. The cumulative increase in employment is almost equivalent to the employment growth for the entire provincial economy in an average year.

The direct plus indirect impacts on Alberta GDP and Personal Income over the historical period amount to $1.7 billion and $1.5 billion (1992$) respectively. The estimated increase in gross revenue of the provincial government is $184 million (1992$).

The future impacts of NovAtel are expected to be considerably larger. Under new management, the product lines, facilities and patents acquired by Telexel / Digicom and Northern Telecom are likely to result in continued and expanding employment and income opportunities for Albertans. There is, however, uncertainty about the size and nature of these developments attributable to the 'old' NovAtel. In order to reflect this uncertainty the analysis has been limited to the next 10 years and two cases have been employed. The Low Case represents the scenario where the revenues from sales of the product lines acquired from the 'old' NovAtel and from sales of variations on these product lines remain constant in real terms. Under the High Case, these real sales revenues are assumed to grow at an average annual rate of 10%.

As indicated in Table 4, the macroeconomic impacts for the total period (that is, 1983 to 2002) are substantial. The cumulative increase in Alberta employment ranges from 78,000 person years under the Low Case to over 100,000 person years in the High Case. The realized increase is likely to be closer to that under the High Case than to that under the Low Case.

The cumulative increase in real GDP for the province is between $7.4 billion and $9.8 billion (1992$). The comparable impact on Alberta Personal Income ranges from $6.4 billion to $8.5 billion. For both variables, the most probable outcome is closer to the results for the High Case.

The increase in provincial government revenue is estimated to be between $800 million and $1 billion (1992$). It should be emphasized that this is the impact in terms of gross revenue. As such, it does not include any adjustment to reflect additional provincial government expenditures directly or indirectly attributable to NovAtel.

4.2 Other Impacts

Industrial development and diversification are particularly important in Alberta given the high degree of economic variabilty in the province and the significant loss of jobs in the key petroleum and agricultural sectors.

NovAtel has played a very significant role in the establishment in the province of the foundations for a growing industrial complex based on microelectronics and wireless communication. Such a complex involves activities which taken individually would not be economically viable in the province but are viable as a combination because of localization economies, linkages and synergies. These arise through a variety of factors including the development of research capabilities, the creation of appropriate infrastructure (including the establishment of firms to supply specialized inputs), the assembly of a critical mass of specialized talent and the implementation of training and cooperative research programs. A few examples demonstrating the key role of NovAtel in the formation of the microelectronics / wireless communications industrial complex are provided in Section 2.4.

This development has been important from a number of vantage points. For example: the diversification has provided a degree of additional stability; the added employment and income opportunities directly and indirectly resulting from NovAtel have been widely distributed throughout the province; a large proportion of these opportunities are of the high-skill and high-value added variety; and, it involves environmentally clean activities.

The prospects are bright for a continuation and expansion of these benefits with the new management and marketing expertise provided by Northern Telecom and Telexel / Digicom. Some of the factors in this regard include: the greater ability of the new organizations to develop international markets for the product lines acquired form the 'old' NovAtel and for derivative product lines; the substantial potential for new products and new variations on existing product lines arising from the numerous patents and intellectual properties acquired, the established research and development programs and the new research and development initiatives such as the Wireless Centre Of Excellence; the prospects for significant technology transfers to other microelectronics products manufactured in Alberta and / or specialized products used by key Alberta industries (such as those in the oil and gas sector); and, the prospects for new Alberta firms to supply inputs for the design, manufacture or operation of wireless communications products (for

example, inputs such as software, system frames and cases and subscriber equipment accessories) and for existing Alberta suppliers to increase local sourcing in the purchase of their inputs.

In summary, these macroeconomic and other benefits of NovAtel are very important and, under the management of Telexel / Digicom and Northern Telecom, they can be expected to continue well beyond the period used for the analysis presented here.

Notes

1. MAE 2.0 is a 1200 equation model of the Alberta economy. A summary can be found in: R.L.Mansell, *An Overview of MAE 2.0*, Project Paper No. 1 for the Model of the Alberta Economy, University of Calgary (1981). Detailed descriptions can be found in volumes 2 to 10 of the MAE Project Paper series.

   This model had been extensively tested and employed. Applications include assessments of: natural gas export projects; fiscal policies; economic diversification; provincial economic instability; real estate markets; pipeline projects; energy policies; fiscal transfers; interregional and international migration; oil sands development; the petrochemical industry; agricultural policies; and, royalty adjustments. A listing of these and other published studies involving MAE 2.0 is available from R. Mansell, Department of Economics, University of Calgary.
2. Data on manufacturing shipments for the province are from Table 10.2 of *Alberta Statistical Review*, (Fall 1991).
3. For additional information on these types of multipliers, see Geoffrey Hewings, *Regional Industrial Analysis and Development*, London: Methuen (1977).
4. A detailed discussion of the determinants of net migration to / from Alberta can be found in R.L.Mansell and A.S.Kwaczek, *The Demographic Sector*, Project Paper No. 2 for the Model of the Alberta Economy, University of Calgary (1982).
5. Data for Alberta employment is from Table 2.12 of *Alberta Statistical Review*, (Fall 1991).
6. See R.L.Mansell and M.B.Percy, *Strength in Adversity: A Study of the Alberta Economy*, Edmonton: WCER and C.D.Howe (1990).
7. That is, the industry exhibits negative covariance with existing industries in the province.
8. For example, see S.Czamanski, *Study of Spatial Industrial Complexes*, Halifax: Dalhousie University, Institute of Public Affairs (1976)

This study was prepared by Dr. R. Mansell, Dr. J. Church, and, Mr. R. Schlenker (B.Sc. (Eng), M.A. (Econ)). Research Assistance was provided by Mr. G. Given (B.A., M.A. cand.).

APPENDIX - SUMMARY OF MACROECONOMIC IMPACTS

Year	Employment (person years)	Gross Domestic Product (MM92$)	Personal Income (MM92$)	Prov. Gov't Revenue (MM92$)
		HISTORICAL		
1983	259	12	10	1
1984	701	81	70	9
1985	807	67	58	9
1986	1576	143	124	16
1987	2101	192	166	20
1988	2474	222	193	23
1989	3535	315	273	31
1990	4279	388	337	43
1991	3313	301	261	32
1983-1991	19045	1720	1491	184
		LOW CASE		
1992	3088	282	245	30
1993	5128	497	431	53
1994	5246	502	435	53
1995	5332	509	441	54
1996	5659	543	471	58
1997	5728	550	477	59
1998	5767	556	482	60
1999	5811	563	488	61
2000	5809	566	490	61
2001	5809	570	494	61
2002	5792	572	496	62
1992-2002	59169	5709	4949	613
1983-2002	78214	7429	6440	798
		HIGH CASE		
1992	3088	282	245	30
1993	5128	497	431	53
1994	5346	512	444	54
1995	5843	562	487	60
1996	6653	645	559	69
1997	7293	710	616	76
1998	8000	784	679	84
1999	8801	868	752	93
2000	9644	958	830	102
2001	10568	1057	916	113
2002	11574	1166	1010	125
1992-2002	81938	8042	6971	859
1983-2002	100983	9762	8462	1043